

BRITISH COLUMBIA Ministry of Agriculture, Food and Fisheries Agricultural Building Systems Handbook

OPEN TOP PRECAST CONCRETE WALL BUNKER SILO 8 TO 20 FT. WALL (TILTUP)

PLAN

372-39



ABOVE-GROUND HORIZONTAL SILO

CPS PLAN M-74

PLAN M-7435 REV. 88:08

This plan gives construction details for a tilt-up concrete horizontal silo designed for tractor packing. It can be built in any length and width that are multiples of 2.4 m (8 ft) and with wall heights from 2.4 m to 6.0 m (8 to 20 ft). The buttresses and wall panels are built with a minimum of forming because they are cast flat on the concrete floor slab and then lifted into position after curing.

The concrete buttress, footings and walls will handle silage and tractor-packing pressures to be published in the Canadian Farm Building Code. Packing pressure is based on a maximum tractor one-wheel load of 1600 kg (3500 lb) or a total four-wheel load of 4600 kg (10 000.lb).

SILO LOCATION AND CONSTRUCTION

- 1. Choose a site with firm, well-drained soil with an estimated bearing capacity at least 100 kPa (2000 lb/ft^2) to support the slab floor and buttress footings.
- 2. Locate on high ground remote from the farmhouse, milk room and other odor-sensitive areas.
- **3.** Face the open end south if possible to minimize freezing, and locate the open end adjacent to a good farm roadway for easy filling and unloading.

FILLING PROCEDURE Fill the silo as quickly as possible. Pack with a tractor during filling to squeeze out air and reduce spoilage. Cover the silage with heavy polyethylene plastic film at the end of each day of filling to cut off the oxygen supply and reduce ensiling losses.

SEALING When filling is completed, seal the exposed silage surfaces quickly with plastic, taped at all lap joints and tucked in at the edges. Secure the plastic tightly with a full layer of bales or old tires to keep it

from billowing in the wind. Earth also can be used to hold the plastic in place, but is more difficult to remove and can get mixed into the silage.

UNLOADING Mechanical unloaders designed specifically for horizontal silos remove the silage smoothly and do a good pulverizing and mixing job. A tractor with a front-end loader is more versatile, but tends to remove frozen silage in chunks that are difficult to feed.

SEEPAGE Harvest silage below 70% moisture (or field-wilt after cutting) to reduce seepage losses and minimize freezing problems.

SILO DIMENSIONS AND CAPACITIES In sizing a silo, consider the following:

- 1. Approximately 15% of the silage stored in horizontal silos is lost due to fermentation and handling.
- 2. To prevent spoilage at the open face, build the silo long enough so that at least 75 mm (2 in.) of silage can be used per day in winter and 100 mm (4 in.) in summer.
- **3.** If one silo is too long for the site, build two or more silos side by side with shared walls and supports between them.
- **4.** Widths less than 9 m (30 ft) and heights above 3.6 m (12 ft) are unsuitable for removal of silage by a front-end loader.
- Calculate silo storage capacity based on a settled dry-matter density of 220 kg/m³ (14 lb/cu ft) if tractor packed, or 160 kg/m³ (10 lb/cu ft) if unpacked. For converting to wet density, multiply dry-matter densities by the following wet-density factors:

	Silage moisture	
		Wet density
%	Water fraction	factor
60	3/5	2.5
67	2/3	3.0
75	3/4	4.0

6. Feed adult dairy and beef cows approximately 12 and 10 kg (26 and 22 lb) of silage dry matter per day, respectively, when silage is the only roughage fed. See Table 1 for dry matter capacity of packed horizontal silos.



FIGURE 1. HORIZONTAL SILO SECTIONS

		Dry matter storage capacity (tonnes)							
Silo width,	Wall height	Silo length (m)*							
(m)	(m)	19.2	24.0	28.8	33.6	38.4	43.2	48.0	52.8
9.6	2.4	84	108	131	155	180	202	225	249
	3.6	124	161	198	234	274	308	345	382
12.0	2.4	105	134	163	192	223	250	279	308
	3.6	153	198	244	289	338	380	425	471
	4.8	196	258	320	383	450	507	569	632
14.4	3.6		236	290	344	402	452	506	560
	4.8		306	380	454	534	602	675	749
	6.0		370	465	559	661	747	842	936
19.2	3.6			382	453	530	596	667	738
	4.8			499	596	701	790	887	984
	6.0			608	732	865	978	1102	1225
24.0	3.6				563	658	739	828	916
	4.8				739	869	979	1099	1219
	6.0				904	1069	1209	1361	1514
		Dry matter storage capacity (tops)							
		Silo Length (ft)							
					Slio Lengtr	n (ft)			
(ft)	(ft)	64	80	96	Silo Lengtr 116	n (ft) 128	144	160	176
(ft) 32	(ft) 8	64 93	80 119	96 144	116 171	128 198	144 223	160 248	176 274
(ft) 32	(ft) 8 12	64 93 137	80 119 177	96 144 218	116 171 258	128 198 302	144 223 339	160 248 380	176 274 421
(ft) 32 40	(ft) 8 12 8	64 93 137 116	80 119 177 148	96 144 218 180	5110 Lengtr 116 171 258 212	128 128 198 302 246	144 223 339 276	160 248 380 308	176 274 421 339
(ft) 32 40	(ft) 8 12 8 12	64 93 137 116 169	80 119 177 148 218	96 144 218 180 269	Silo Lengtr 116 171 258 212 319	128 198 302 246 373	144 223 339 276 419	160 248 380 308 468	176 274 421 339 519
(ft) 32 40	(ft) 8 12 8 12 16	64 93 137 116 169 216	80 119 177 148 218 284	96 144 218 180 269 353	Silo Lengtr 116 171 258 212 319 422	128 198 302 246 373 496	144 223 339 276 419 559	160 248 380 308 468 627	176 274 421 339 519 697
(ft) 32 40 48	(ft) 8 12 8 12 16 12	64 93 137 116 169 216	80 119 177 148 218 284 260	96 144 218 180 269 353 320	Silo Lengtr 116 171 258 212 319 422 379	128 198 302 246 373 496 443	144 223 339 276 419 559 498	160 248 380 308 468 627 558	176 274 421 339 519 697 617
(ft) 32 40 48	(ft) 8 12 8 12 16 12 16	64 93 137 116 169 216	80 119 177 148 218 284 260 337	96 144 218 180 269 353 320 419	Silo Lengtr 116 171 258 212 319 422 379 500	128 198 302 246 373 496 443 589	144 223 339 276 419 559 498 663	160 248 380 308 468 627 558 744	176 274 421 339 519 697 617 825
(ft) 32 40 48	(ft) 8 12 8 12 16 12 16 12 16 20	64 93 137 116 169 216	80 119 177 148 218 284 260 337 408	96 144 218 180 269 353 320 419 512	Silo Lengtr 116 171 258 212 319 422 379 500 616	128 198 302 246 373 496 443 589 728	144 223 339 276 419 559 498 663 823	160 248 380 308 468 627 558 744 928	176 274 421 339 519 697 617 825 1032
(ft) 32 40 48 64	(ft) 8 12 8 12 16 12 16 20 12	64 93 137 116 169 216	80 119 177 148 218 284 260 337 408	96 144 218 180 269 353 320 419 512 421	Silo Lengtr 116 171 258 212 319 422 379 500 616 499	128 198 302 246 373 496 443 589 728 584	144 223 339 276 419 559 498 663 823 657	160 248 380 308 468 627 558 744 928 735	176 274 421 339 519 697 617 825 1032 813
(ft) 32 40 48 64	(ft) 8 12 8 12 16 12 16 20 12 16 20 12 16	64 93 137 116 169 216	80 119 177 148 218 284 260 337 408	96 144 218 180 269 353 320 419 512 421 550	Silo Lengtr 116 171 258 212 319 422 379 500 616 499 657	128 198 302 246 373 496 443 589 728 584 773	144 223 339 276 419 559 498 663 823 657 871	160 248 380 308 468 627 558 744 928 735 978	176 274 421 339 519 697 617 825 1032 813 1084
(ft) 32 40 48 64	(ft) 8 12 8 12 16 12 16 20 12 16 20 12 16 20	64 93 137 116 169 216	80 119 177 148 218 284 260 337 408	96 144 218 180 269 353 320 419 512 421 550 670	Silo Lengtr 116 171 258 212 319 422 379 500 616 499 657 807	128 198 302 246 373 496 443 589 728 584 773 953	144 223 339 276 419 559 498 663 823 657 871 1078	160 248 380 308 468 627 558 744 928 735 978 1214	176 274 421 339 519 697 617 825 1032 813 1084 1350
(ft) 32 40 48 64 80	(ft) 8 12 8 12 16 12 16 20 12 16 20 12 16 20 12 16 20 12	64 93 137 116 169 216	80 119 177 148 218 284 260 337 408	96 144 218 180 269 353 320 419 512 421 550 670	Silo Lengtr 116 171 258 212 319 422 379 500 616 499 657 807 620	128 198 302 246 373 496 443 589 728 584 773 953 725	144 223 339 276 419 559 498 663 823 657 871 1078 814	160 248 380 308 468 627 558 744 928 735 978 1214 912	176 274 421 339 519 697 617 825 1032 813 1084 1350 1009
(ft) 32 40 48 64 80	(ft) 8 12 8 12 16 12 16 20 12 16 16 16 16 16 16 16 16 16 16	64 93 137 116 169 216	80 119 177 148 218 284 260 337 408	96 144 218 180 269 353 320 419 512 421 550 670	Silo Lengtr 116 171 258 212 319 422 379 500 616 499 657 807 620 814	128 198 302 246 373 496 443 589 728 584 773 953 725 958	144 223 339 276 419 559 498 663 823 657 871 1078 814 1079	160 248 380 308 468 627 558 744 928 735 978 1214 912 1211	176 274 421 339 519 697 617 825 1032 813 1084 1350 1009 1343

TABLE 1. DRY MATTER CAPACITY OF PACKED HORIZONTAL SILOS

* For unpacked capacities, multiply above capacities by 0.7.